pendent elliptic orbit very closely resembling that computed by Prof. Boss. The first two places used are the same as those Prof. Boss employed; the third is one obtained on April 16 at Harvard College. Prof. Boss gives the following ephemeris for Greenwich midnight:—

1888.	R.A.			Decl.			Log *r*.	Log Δ.
	h.	m.	s.	°	′	″		
May 26	0	17	19·4	38	1	45 N.	0·17274	0·26595
28	0	20	45·6	38	43	8	0·18109	0·27036
30	0	24	5·5	39	23	19	0·18928	0 27459
June 1	0	27	19·0	40	2	24	0·19730	0·27864
3	0	30	26·1	40	40	25	0·20516	0·28252
5	0	33	26·6	41	17	26	0·21287	0·28623
7	0	36	20·5	41	53	30	0·22042	0·28978
9	0	39	7·6	42	28	39	0·22783	0·29317
11	0	41	47·8	43	2	56	0·23509	0·29639
13	0	44	21·1	43	36	23	0·24222	0·29947
15	0	46	47·5	44	9	1 N.	0·24921	0·30240

The light ratio on June 15 is $\frac{1}{20}$ of that at discovery.

New Minor Planet —A new minor planet, No. 278, was discovered by Herr Palisa at Vienna on May 16.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 *MAY* 27—*JUNE* 2.

(For the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on May 27

Sun rises, 3h. 54m.; souths, 11h. 56m. 57·8s.; sets, 19h. 59m.: right asc. on meridian, 4h. 18·8m.; decl. 21° 25′ N. Sidereal Time at Sunset, 12h. 22m.

Moon (at Last Quarter June 1, 13h.) rises, 21h. 10m.*; souths, 1h. 27m.; sets, 5h. 41m.: right asc. on meridian, 17h. 47·6m.; decl. 20° 31′ S.

Planet.	Rises.	Souths.	Sets.	Right asc. and declination on meridian.	
	h. m.	h. m.	h. m.	h. m.	° ′
Mercury..	4 42	13 14	21 46	5 35·8	25 29 N.
Venus.....	3 26	11 6	18 46	3 28·2	17 56 N.
Mars......	14 42	20 22	2 2*	12 45·1	4 31 S.
Jupiter....	19 12	23 31	3 50*	15 55·3	19 22 S.
Saturn....	8 2	15 57	23 52	8 19·3	20 14 N.
Uranus...	14 47	20 27	2 7*	12 50·2	4 39 S.
Neptune..	3 47	11 31	19 15	3 52·8	18 35 N.

Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich).

May.	Star.	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image.
			h. m.	h. m.	° °
27	31 Sagittarii	6	22 17†	23 23	49 240
30	20 Capricorni	6	2 45	3 38	40 322

† In horizon at Greenwich.

Variable Stars.

Star	R.A.	Dec'.			
	h. m.	° ′		h. m.	
U Cephei	0 52·4	81 16 N.	May 27,	0 57	*m*
			June 1,	0 36	*m*
U Cancri	8 29·4	19 17 N.	May 28,		*M*
S Leonis	11 5·1	6 4 N.	,, 27,		*M*
R Corvi	12 13·8	18 38 S.	June 2,		*M*
R Boötis	14 32·3	27 13 N.	May 29,		*M*
U Coronæ	15 13·6	32 3 N.	June 1,	0 37	*m*
S Libræ	15 15·0	19 59 S.	,, 2,		*m*
R Scorpii	16 11·0	22 40 S.	May 30,		*M*
U Ophiuchi	17 10·9	1 20 N.	,, 28,	2 8	*m*
			and at intervals of	20 8	
W Sagittarii	17 57·9	29 35 S.	May 27,	21 0	*M*
Z Sagittarii	18 14·8	18 55 S.	,, 27,	1 0	*M*
			,, 31,	0 0	*m*
β Lyræ	18 46·0	33 14 N.	,, 30,	21 0	*M*
R Lyræ	18 51·9	43 48 N.	June 2,		*M*
S Vulpeculæ	19 43·8	27 1 N.	May 29,		*m*
S Sagittæ	19 50·9	16 20 N.	,, 28,	3 0	*M*
T Vulpeculæ	20 46·7	27 50 N.	,, 31,	23 0	*M*
			June 2,	1 0	*m*
δ Cephei	22 25·0	57 51 N.	,, 1,	1 0	*M*
S Pegasi	23 14·9	8 18 N.	May 29,		*M*

M signifies maximum; *m* minimum.

Meteor-Showers.

	R.A.	Decl.	
	°	°	
Near χ Boötis	227	30 N.	June 2.
,, 54 Draconis	290	60 N.	Slow, short. May 30.
From Vulpecula	303	24 N.	Swift.
Near ι Pegasi	332	27 N.	Swift. Very long paths. Streaks.

GEOGRAPHICAL NOTES.

Referring to the ethnology of the Himalayan hill region of Sikkim, where a small British force is at present in occupation, the *Madras Mail* says that the population may, broadly speaking, be divided into three nationalities: the Lepchas, who are the aborigines; the Nepalese immigrants, now forming nearly half the entire population; and the Bhuteas, or Bhutanese, who very closely resemble the Tibetans, and are pure Tartars. It is remarkable that the last-named are like the Chinese in the make of their hats, clothes, and boots, and in their pig-tails, but their language is somewhat like Turkish in its sound. It is supposed that this people originally came from Tibet, though they apparently derive their name from Bhutan, which lies to the east of Sikkim. They are tall, strong, and hardy, though they are accused of being lazy. They have their Buddhist temples, and erect long poles round their houses, with paper streamers on which are printed prayers in Chinese looking characters. One may often meet them on the roads twirling their praying-machines, which are cylinders of brass or copper, with a printed roll of prayer inside, and small weights attached to it to make it revolve when once it is set going. It is thought that amongst them, like the Tibetans, polyandry prevails. The women are large and coarse-featured; they wear thick woollen clothes of bright colours, and numerous massive gold and silver ornaments. Some of them smear themselves with a brownish ointment which makes their faces appear as if a coating of French polish had been put on. With regard to the aborigines of Sikkim, they are a Mongolian race, short and stout. In appearance they resemble closely the Nepalese, though, far different from the latter, who are brave soldiers, they are the most arrant cowards. They live by cultivating small tracts of the forests, which they clear by setting fire to the trees and brushwood, and move to a fresh spot each year. As may be supposed, their agriculture is of the most primitive description, and in their language they have no word for a plough. They worship the forces of Nature under the form of demons; the Bhuteas also, though professed Buddhists, propitiate evil demons, the same sort of imaginary beings as the Nats of the Burmese. The Lepchas are monogamous. The race is gradually dying out. The Limboos are a race of half-breeds between the Nepalese and the Lepchas, but resembling the former more than the latter. There are several similar mongrel races to be found in Sikkim, for the Nepalese immigrate in vast numbers, being driven out of their own country by press of over-population. Few ever return to their own country, and great numbers of them work as coolies on the tea estates. Their religion is a mixture of Buddhism and Brahminism, and they boast of their caste distinctions. Many of them carry curved weapons in their belts, while the Bhuteas and Lepchas use straight-bladed weapons. The Bhutea sword is like that of the old Roman legionary, but the hilt has no guard, after the Mongolian fashion. Amongst the jungles of Perai there are some curious aboriginal tribes, who do not appear to suffer from the malaria which attacks everybody else who sets foot in their territory; but it is said that if they leave their jungles they are immediately attacked themselves by fever, the malarial poison with which they have become inoculated thus finding an exit when they quit their own locality. All the natives of the plain call these races indiscriminately "Pahariyas," or "hill-men," who, though they differ from each other, differ still more from the inhabitants of the plain in their language and mode of life. They are all mountaineers and Mongolians, and have all great physical strength. A story is told of a Bhutea woman who once carried a grand piano up the Ghaut from Punkabari to Darjeeling in three days, and arrived on the third day quite fresh and unexhausted at her destination with her burden on her back.

A recent number of the *China Review* (vol. xvi. No. 3) contains a long paper by Mr. Taylor, whose publications on

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Formosa and its people have frequently been noticed in these columns, entitled "A Ramble through Southern Formosa." It really describes a long journey along the almost wholly unknown east coast, and has much information respecting the various tribes, their relations to each other and to the Chinese Government—the Tipuns, Paiwans, Diaramocks, Amias, and others. Mr. Taylor refuses to discuss gravely the theory of a cataclysm put forward to account for the aborigines in Formosa. "One might just as well introduce the mythical convulsion which lost Atlanta to Europe, and detached Great Britain from the neighbouring continent, to account for the painted savages Cæsar found in England." The Tipuns are probably descended from emigrants from some northern islands, probably Japan; the Paiwans as a rule inhabit the mountains of the interior, and are head-hunters, a cruel, predatory, and passionate race, probably of Malay origin, and the very earliest settlers in Southern Formosa. The Pepohoans probably came from Loochoo; they have no language of their own, speaking only Chinese, while all the other tribes have their own tongue. The Diaramocks are the most dreaded tribe of the south part of the island; they are reputed cannibals, but Mr. Taylor doubts whether they are not accused without cause. The paper concludes with some vigorous engravings of representatives of the different tribes, including a Diaramock, a Tipun chief, an Amia, a Paiwan, a Tipun warrior, a Nicka, and Tipun weapons.

THE *Bollettino* of the Italian Geographical Society for April publishes the results of some preliminary studies, by Prof. Giulio Beloch, of the Roman University, on the vital statistics of Italy during the last three centuries. According to these studies, the total population of the peninsula has increased from a little over 11,000,000 in 1550 to 13,000,000 in 1700, 16,500,000 in 1775, over 18,000,000 in 1880, and nearly 30,000,000 in 1887. The growth of the population for some of the larger States is given as under:—

States.	Year.	Pop. in millions.	Year.	Pop. in millions.	Year.	Pop. in millions.
Naples ...	1511	2·7	1700	3·0	1770	4·09
Sicily	1570	1·07	1714	1·12	1770	1·48
States of the Church ...	1560	1·6	1701	1·98	1769	2·17
Tuscany ...	1562	0·8	1738	0·89	1766	0·94
Venetia ...	1548	1·6	1700	1·8	1766	2·24
Milanese ...	1542	1·0	1724	1·1	1773	1·1
Piedmont ...	1569	1·05	1723	1·55	1773	2·3
Sardinia ...	1575	0·15	1728	0·3	1775	0·42

A GEOLOGICAL Expedition, under the leadership of MM. Ivanoff and Konshin—the two well-known investigators of the geology of Turkistan—is to be sent out this summer for the exploration of the littoral region of Russian Mantchuria. The orography of this region is hardly yet known, and the Expepition will certainly throw some light on the structure of the chains of mountains which are still hypothetically represented on our maps.

THE IRON AND STEEL INSTITUTE.

THE annual meeting of the Iron and Steel Institute took place last week at the theatre of the Institution of Civil Engineers, under the presidency of Mr. Daniel Adamson. On the motion of the President, His Royal Highness the Prince of Wales was unanimously elected an honorary member. Sir Henry Bessemer presented the Bessemer medal to the President, and referred in the course of his remarks to the circumstance that whereas in Sheffield, the stronghold of steel-making, he could find no one to investigate his process when he first brought it out, fortunately for him—and he might add, fortunately for the world—their President, Mr. Daniel Adamson, did so, and having satisfied himself as to its applicability determined to employ it. The President, whose investigations with regard to steel are well known, thanked Sir Henry Bessemer and the Council of the Institution for the award, and referred to his early connection with Bessemer steel, which metal he had continued to use ever since.

The President then delivered the annual address, which was mainly statistical in character. The Iron and Steel Institute had been nineteen years in existence, during which period 2116 members had been elected, including seventy-two elected at the present meeting. He drew attention to the falling off which had taken place in the production of manufactured iron in this country since 1884, and the large increase in the production of steel during the same period. Thus in 1884 about one and a quarter million tons of Bessemer steel ingots were produced, and in 1887 about two million tons, being an increase of about 60 per cent.; in 1884 nearly half a million of tons of Siemens open-hearth steel ingots were cast, and nearly a million tons last year, the actual increase during the period being over 106 per cent., besides which plant is at present in course of erection estimated to produce another quarter of a million tons annually. During the same period there has been an enormous increase in the application of steel to shipbuilding purposes. Thus from a table supplied to the President by Mr. William Parker, Chief Engineer to Lloyd's Registry of British and Foreign Shipping, it is found that whereas in 1878, under 3000 tons of steel were employed in the manufacture of steamers and sailing-vessels built under Lloyd's survey, and over 300,000 tons of iron, last year over 210,000 tons of steel were employed and about 52,000 tons of iron. The proportional increase in the use of steel in the last three years has been about cent. per cent., and the falling off in the use of iron during the same period 350 per cent. Before leaving the subject of steel, the President referred to the papers read at the Institution of Civil Engineers on "Manganese in its Application to Metallurgy," and on "Some Novel Properties of Iron and Manganese," wherein it was shown that whereas 2·5 to 7·5 per cent. of manganese in steel makes it as brittle as glass, breaking under a much less transverse load than cast iron, 12 to 14 per cent. of manganese in the metal secures high carrying power with great elongation. Thus a bar of the composition—carbon 0·85 per cent., silicon 0·23 per cent., sulphur 0·08 per cent., phosphorus 0·09 per cent., and manganese 13·5 per cent., carried a load of 57·02 tons to the square inch, and took a permanent set at 29½ tons, with an elongation of 39·8 per cent. This metal is toughened by heating it to a high temperature, and plunging it into water at a temperature of 72° F. It is difficult to machine, which would militate against its practical application for many purposes, unless cooling in water whilst developing strength and toughness should also have a softening tendency. The President concluded his address by drawing attention to the influence of the alloys they contain on the various applications of pig metal, as outside of high-class hæmatites that are used for the manufacture of Bessemer and open-hearth steel, selections may be made giving the highest results without using some of the higher-priced irons that are now considered necessary for given purposes.

Mr. Carbutt, President of the Institution of Mechanical Engineers, in proposing a vote of thanks to the President for his address, drew attention to the interesting circumstance noted by Mr. Parker that 100 tons can now be carried one mile by steamships at the rate of thirteen miles an hour, at a total cost, including fuel, insurance, &c., of seven-eighths of a penny.

The papers read and discussed at this meeting ranged over a large variety of subjects. Mr. T. Turner's paper on "Silicon and Sulphur in Cast Iron," read at a previous meeting, was discussed. The conclusions at which the author arrives are that in the blast furnace three chief agencies are at work tending to eliminate sulphur, of which in Cleveland practice not more than one-twentieth passes into the iron: (1) a high temperature tends to prevent the absorption of sulphur by iron; (2) a slag rich in lime readily combines with sulphur; and (3) the amount of sulphur actually retained by the metal is influenced by the proportion of silicon and probably certain other elements present in the iron—the more silicon the less sulphur. This paper was discussed by Messrs. Snelin, Gautier, Riley, Bauerman, and Sir Lowthian Bell; but the author, in his reply on the discussion, considered that nothing had been brought forward to disprove what he maintained, viz. that if they put silicon and sulphur together in iron, they would not combine there, the sulphur would pass off and the silicon remain.

Mr. Gautier read a paper on the melting in cupola furnaces of wrought iron or steel scrap mixed with ferro-silicon, the conclusion at which he arrived being that ordinary wrought-iron scrap so heated may yield results as good as those obtained from castings made with ordinary steel scrap. This conclusion was contested, however, by various speakers in discussion.

A paper read at the last meeting of the Institute by Mr. A. Wilson, on "The Use of Water Gas for Metallurgical

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